CLAIMS:

1. A method for the spatially resolved determination of mechanical, physical, chemical and/or biological properties or state variables and/or the change in mechanical, physical, chemical and/or biological properties or state variables in an examination area of an examination object by means of the following steps:

a) introducing magnetic particles into at least part of the examination area,

b) generating a magnetic field with a spatial profile of the magnetic field strength such that there is produced in the examination area a first part-area having a low magnetic field strength and a second part-area having a higher magnetic field strength,

c) generating a superposed oscillating or rotating magnetic field at least partially in the first part-area having a low magnetic field strength, so that at least some of these magnetic particles oscillate or rotate,

d) irradiating electromagnetic radiation into the examination area by means of at least one radiation source and

e) detecting the reflected and/or scattered electromagnetic radiation by means of at least one detector and determining the intensity, absorption and/or polarization of the reflected and/or scattered electromagnetic radiation.

2. A method as claimed in claim 1, characterized in that the, in particular relative, spatial position of the two part-areas in the examination area is changed so that the magnetization of the particles changes locally, and the signals which depend on the magnetization in the examination area that is influenced by this change are detected and evaluated so as to obtain information about the spatial distribution and/or the change in the spatial distribution of the magnetic particles in the examination area.

3. A method as claimed in claim 1 or 2, characterized in that the magnetic particles are superparamagnetic particles, in particular with an effective anisotropy, ferromagnetic monodomain particles with an effective anisotropy that is sufficient for the particles still to behave in a superparamagnetic manner only in a suspension, soft-magnetic particles, in particular having an anisotropy, and/or hard-magnetic particles.

4. A method as claimed in any of the preceding claims, characterized in that the magnetic particles are in a liquid, viscous or gel-like shell in the examination area or are introduced into said shell.

5. A method as claimed in any of the preceding claims, characterized in that the electromagnetic radiation used is microwave, infrared, VIS, ultraviolet and/or X-ray radiation.

6. A method as claimed in any of the preceding claims, characterized in that at least one optical contrast agent, in particular a fluorescent contrast agent, is introduced into or present in the examination area.

7. A method as claimed in any of the preceding claims, characterized in that the scattered and/or reflected electromagnetic radiation is detected and evaluated in a direction-dependent manner.

8. A method as claimed in any of the preceding claims, characterized in that the change in intensity of the scattered and/or reflected electromagnetic radiation is detected as a function of the oscillation mode or the rate of rotation.

9. A method as claimed in any of the preceding claims, characterized in that electromagnetic radiation of at least one specific wavelength and/or wavelength spectrum is used.

10. A method as claimed in any of the preceding claims, characterized in that the radiation source is an optical fiber or a number of optical fibers, in particular integrated in a catheter or an endoscope.

11. A method as claimed in any of the preceding claims, characterized in that the part-area having a low magnetic field strength is moved by actuating and/or moving the coil arrangement or in that in the case of a stationary part-area having a low magnetic field strength the examination object is moved or in that the examination object and the part-area having a low magnetic field strength are moved relative to one another at the same time.

12. An arrangement (1) for carrying out the method as claimed in any of claims 1 to 11, comprising

a) at least one device (10) for generating a magnetic gradient field (2) in at least one examination area of the examination object (A), said device comprising a means for generating a magnetic field with a spatial profile of the magnetic field strength such that there is produced in the examination area a first part-area (4) having a low magnetic field strength and a second part-area (8) having a higher magnetic field strength,

b) at least one radiation source (12) for generating electromagnetic radiation and

c) at least one detector (22) for recording reflected and/or scattered electromagnetic radiation.

13. An arrangement (1) as claimed in claim 12, further comprising a means for changing the, in particular relative, spatial position of the two part-areas in the examination area so that the magnetization of the particles changes locally, a means for detecting signals which depend on the magnetization in the examination area that is influenced by this change and a means for evaluating the signals so as to obtain information about the spatial distribution of the magnetic particles in the examination area.

14. An arrangement (1) as claimed in claim 12 or 13, characterized in that the means for generating the magnetic field comprise a gradient coil arrangement for generating a magnetic gradient field which in the first part-area of the examination area reverses its direction and has a zero crossing.

15. An arrangement (1) as claimed in any of claims 12 to 14, characterized by means for generating a temporally changing magnetic field that is superposed on the magnetic gradient field, for the purpose of moving the two part-areas in the examination area.

16. An arrangement (1) as claimed in any of claims 12 to 15, characterized by a coil arrangement for receiving signals induced by the temporal change in the magnetization in the examination area.

17. An arrangement (1) as claimed in any of claims 12 to 16, characterized by means for generating a first and at least a second magnetic field that are superposed on the magnetic gradient field, where the first magnetic field changes slowly in time terms and with

a high amplitude and the second magnetic field changes rapidly in time terms and with a low amplitude.

18. An arrangement (1) as claimed in claim 17, characterized in that the two magnetic fields run essentially perpendicular to one another in the examination area.

19. An arrangement (1) as claimed in any of claims 12 to 18, characterized in that there is at least one monochromator (16), chopper (18) and/or polarizer (20) between the radiation source (12) and the examination area.

20. An arrangement (1) as claimed in any of claims 12 to 19, characterized in that the radiation source is a laser.

21. An arrangement (1) as claimed in any of claims 12 to 20, characterized in that there is at least one analyzer (26), in particular in the form of a polarization filter, and/or one monochromator (28) between the detector (22) and the examination area.

22. An arrangement (1) as claimed in any of claims 12 to 21, characterized by an evaluation unit (30) for determining and/or evaluating the detected radiation signals.

23. An arrangement (1) as claimed in any of claims 12 to 22, characterized in that the detector (22) is a camera or is connected to or in effective connection with the latter and/or with an evaluation unit (30), in particular a microprocessor.

24. Optical contrast composition for magnetic particle imaging comprising optical contrast particles having anisotropic optical properties and which particles comprise magnetic particles or a coating of a magnetic material.

25. Optical contrast composition according to claim 24, wherein the optical contrast particles have a main magnetic direction and a main optical anisotropy direction, which main magnetic direction and main optical anisotropy direction are correlated such that, when the optical contrast particles in the optical contrast composition align their main magnetic direction in an external magnetic field, their optical anisotropy direction is at least partly aligned.

26. Optical contrast composition according to claim 24 or 25, wherein the optical contrast particles have an anisotropic shape.

27. Optical contrast composition according to claim 24 or 25 , wherein a part of the surface of the optical contrast particles has different optical properties than the remainder of the surface.

28. Optical contrast composition according to claim 27, wherein the surface of the optical contrast particles is partly coated or covered with an optically active coating material having a specific interaction with light, in particular a fluorescent material, a reflective material, a dye or a pigment.

29. Optical contrast composition according to claims 24 to 28, wherein the magnetic particles comprise anisotropic magnetic particles having an anisotropy field of at least 2mT, so particles can rotate by applying external fields.

30. Optical contrast composition according to claim 29, wherein the magnetic particles also comprise soft magnetic particles for concentration imaging contrast improvement.

31. Process for the manufacture of an optical contrast composition according to claims 24 to 30, comprising aligning particles having optical anisotropic properties along a main optical anisotropy direction and depositing magnetic particles on said optical anisotropic particles in the presence of a magnetic field along a main magnetic direction.

32. Process according to claim 31, wherein the anisotropic optical particles are anisotropic shaped particles, preferably disc shaped particles, which are aligned by depositing them on a surface.

33. Process for the manufacture of an optical contrast composition according to claims 24 to 32, comprising aligning in a magnetic field magnetic particles having magnetic anisotropic properties along a main magnetic direction and providing an optically active coating along a main optical anisotropy direction.

34. Process according to claims 31 to 33, wherein the particles after being deposited on a surface are provided on one side thereof with an optically active coating material.

35. Method for imaging optical properties in an examination area comprising the steps of introducing an optical contrast composition according to anyone of claims 24 to 30, irradiate the examination area with light, scanning the examination area with the field free region according to the method for magnetic particle imaging according to claims one to 11 and recording reflected optical signals as a function of the position of the field free point to spatially resolve the optical properties in the examination area.

36. Magnetic particle composition having a magnetization curve having a step change, the step change being characterized in that the magnetization change, as measured in an aqueous suspension, in a first field strength window of magnitude delta around the inflection point of said step change is at least a factor 3 higher than the magnetization change in the field strength windows of magnitude delta below or in the field strength windows of magnitude delta above the first field strength window, wherein delta is less than 2000 microtesla and wherein the time in which the magnetisation step change is completed in the first delta window is less than 0.01 seconds.

37. Use of the magnetic particle composition according to claim 36 in a method according to anyone of claims 10 to 18 or 35.

38. Optical contrast composition according to anyone of claims 24 to 30, wherein the magnetic particles are a magnetic particle composition according to claim 36.